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ulare are always brown; those of *P. erectum* bright green. I once saw the *P. erectum* growing right up through a patch of *P. aviculare*. They are as easily distinguished as any other two species.

PHYSALIS LANCEOLATA, PENNSYLVANICA, AND HIRTA.

Gray makes all three of these varieties of the same. Wood makes the first two varieties, and does not mention the third. I have seen many specimens of all three. I have not noted a difference in the leaves or the flowers of the first two, but *P. lanceolata* is pubescent or puberulent; branches near the ground, is soon prostrate or leaning, only a foot high, blossoms in June, and its fruit calyx is cylindrical, more than an inch long, and has at the base a hemispherical depression.

P. pennsylvanica is glabrous, has a clean stem half its height, always erect, height, twenty to twenty-four inches, blossoms in August, and its fruit calyx is broad-oval, three-fourths of an inch long, and has a convex base.

P. hirta is very unlike to either of these. Stem and leaves pubescent, leaves entire, somewhat rhomboidal, twice as large as those of the other two, and the blossoms are all yellow. Mr. Gray was in a hurry when he said this was a variety of *P. pennsylvanica*.

QUERCUS TINCTURIA AND COCCINCA.

The older editions of both Gray and Wood make them distinct species; the later make them only varieties. I cannot think of a reason for doing so. The leaves of *Q. tinctoria* are always obovate, those of *Q. coccinea* never. The full descriptions are as distinct as those of any other two species.

THE INSULATION RESISTANCE OF SOME ELECTRIC-LIGHT WIRES.

BY PROF. LUCIEN BLAKE AND H. RADCLIFFE, LAWRENCE.

The insulation resistance of electric-light wires is commercially of great importance. Leakage through defective or insufficient insulation represents not only expensive waste, but great danger to the generating machines by grounding them, and thus exposing their armatures to burning out. The element of risk to life and property also depends somewhat upon the character of the insulating sheath of the wires.

Ten years ago the so-called underwriters' wire was extensively and almost exclusively used for outside work, because recommended by the board of underwriters in New York. To-day, however, no thoroughly-posted electrician will use it, for it cannot resist moisture, and many fires in buildings and many burnings-out of armatures traceable to it have justly led to its condemnation.

At the present time there are some eight or ten well-known wires upon the market. The reputation of these wires has been established largely by the firms handling them, and not often have any scientific tests upon them been made.

The insulation sheath of an arc-light wire may be considered to have two functions, one electrical and the other mechanical, though the former is largely dependent upon the latter. Electrically, it must keep the electric current in the wire without leakage; mechanically, it must resist abrasion, heat, and moisture. The experience of any good and observant electric-light company will determine a wire's claims to the mechanical part, though wires have not been under trial a sufficiently long time yet to thoroughly prove them; a long-time exposure may develop faults not yet suspected; in fact, what changes may occur in the mechanical qualities of wires bearing for many years high-tension currents, we do not know. Particularly as re-

gards alternating currents, it seems to us highly probable that after some years the wires will show unexpected changes in brittleness and tensile strength. We know scarcely anything yet about heavy alternating currents.

Certain facts, however, in regard to the electrical qualities of an insulating sheath may be determined by tests. With this object in view, experiments were made in the spring of this year, in the physical laboratory of the State University, upon six of the principal arc-light wires in the market. All of them had been in outside use by the Lawrence Electric Light Company. These tests were made to determine the insulating power of the wires against leakage when exposed to moisture. The wires were No. 6, American wire gauge, guaranteed by the makers to be water-proof. Lengths of about 25 feet were taken, wound into coils, and immersed in large tubs filled with hydrant-water. The two ends of each coil projected about two feet out of the water. The coils were left in the water for nearly three months, measurements at first being made every day so long as considered necessary. The mode of testing was that known as the substitution method. One of the projecting ends of a coil of wire was connected to a delicate Wiedemann adjustable-coil dead-beat mirror galvanometer and to the positive pole of a single gravity cell. The negative pole was connected by a wire to a copper plate 20 inches square, which was placed in each tub of water, in the center of the coil. The other projecting end of each coil was left insulated in the air. Resistance boxes reading to 100,000 and 33,000 ohms, respectively, were so connected that they could be substituted in the circuit of the galvanometer and battery in place of any particular coil. For convenience, a special mercury switch was so constructed that the observer could throw in succession the different coils or the resistance boxes into the galvanometer circuit, and by equal deflections the resistances of the insulation sheaths could be determined. It is evident by the arrangements of the experiment, that only through the insulating layer of the wire could the current escape to complete the galvanometer circuit; and from the reputation of the wires, only a small leakage was to be expected. The insulation resistance should be several million ohms per mile. We have embodied our results in the form of curves indicated in the following diagram. (Explain curves.) After three months' immersion final tests were made, which gave the following results:

No. 1.....	7,200 ohms per yard.
No. 2.....	8,067 ohms per yard.
No. 3.....	816,000 ohms per yard.
No. 4.....	7,333 ohms per yard.
No. 5.....	3,702 ohms per yard.
No. 6.....	3,300 ohms per yard.

As the result of these tests, No. 3 is now used almost exclusively on the Lawrence electric light circuits; and at this writing, after nearly a year of out-door exposure, the insulation seems as perfect as at first.

ON BARITE AND ASSOCIATED MINERALS IN THE CONCRETIONARY ROCKS OF EASTERN KANSAS.

BY PROF. E. H. S. BAILEY, AND E. E. SLOSSON, LAWRENCE.

[Abstract.]

These rocks are found as boulders upon the hills in the vicinity of Lawrence, especially upon Mount Oread. It seems probable that there is a layer of these rocks below the surface. Similar boulders are found in Jefferson county along the line of the narrow-gauge road, in some places beneath layers of clay and above the lime-